Title

Market-Share Analysis: Communicating Results Through Spreadsheet-Based Simulators

Author

Cooper, Lee

Publication Date

2023-12-14

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L. G. Cooper
Anderson Graduate School of Management, University of California
Los Angeles CA 90024-1481

Summary

This article describes the information-systems theory and the pedagogy behind the development of C.A.S.P.E.R.—Competitive Analysis System for Product Performance and Promotional Effectiveness Research. Managers must be able to learn from historical data (and graphical summaries can be very effective in this role), simulate the market response to proposals, and evaluate plans in a dynamic, competitive environment. The CASPER software performs these three basic functions using an asymmetric market-share model as the market simulator.

1 Introduction

In any information system there are three basic ingredients: data, models and the software or other vehicles which organize data and models so that they facilitate decision making. One extreme position in the design of information systems, which could be called *datum ipso loquitor*, emphasizes the data at the expense of the models, while the facilitation of decision making amounts to little more than data-base management software. Another extreme position emphasizes the facilitation of decision making by the codification of expert knowledge and/or expert decision processes—placing *content knowledge* at the disposal of brand managers. The software described by Burke and Rangaswamy (1987) is one of numerous recent illustrations of such an approach. After prompting a manager to describe the promotional and competitive conditions in a market, software helped to plan the style of marketing support which would be effective.

We advocate a third position. We believe that the comprehensiveness of the data now becoming available to brand managers could fundamentally change the conventional wisdom. We must develop and implement models rich enough to capture the diversity of these data, and develop decision-support software which, while summarizing and organizing the information in data and models, will also entice brand managers to expend more effort to understand the implications of their actions.

There are four basic questions which market information systems must address:

1. How does a firm's marketing efforts affect its brand's performance?

2. How is a brand affected by competitors' actions and reactions?

3. How does a brand's actions affect others?

4. What are the revenue and cost implications of market actions and reactions?

The marketplace is providing abundant data on sales for all brands in a category, along with the promotional environment in which those sales occur. Firms can augment these data with cost estimates of their own operations, their competitors cost and costs in the channels of distribution. Then regardless of whether a firm's objectives are cast in terms of sales, market shares or profits, sales-response models provide the relationships which tie the market conditions to the firm's objectives.

Much more information can be added to the mix. Panel-based measures of consumer loyalty (Guadagni and Little (1983)) and consumer perceptions or attribute ratings (Cooper and Finkbeiner (1984)) are just two of many potential enriching sources. While it is important that modeling frameworks are compatible with these additional sources of data, we will be using sales, prices and promotional conditions as the core. We divide the process of modeling sales response into two components—models of market share and models of total category volume. An asymmetric market-share model (Carpenter, Cooper, Hanssens and Midgley (1987)) reflects a brand's actions in a competitive context. It focuses on relative efforts, how a brand's actions stand out from the competitive context, and how the distinctiveness of a brand's efforts and the relative effectiveness of those efforts translate into shares (Cooper and Nakanishi (1983a)). The category-volume component shows how the raw levels of marketing actions by each brand relate to the total sales in that category.

Market share times total category volume will equal sales. Beyond the mathematical identity, the synthesis of these two components must be diagnostically rich to fulfill the planning role. The richness is conveyed by parameters, elasticities and simulations. In simple *constant-elasticity models* the parameters give a quick summary of the effectiveness of marketing efforts. But effectiveness of efforts is not independent of the competitive context in which those efforts occur. Constant-elasticity models provide an impoverished picture of how the effectiveness varies with different competitive responses. The move to diagnostically richer models of competitive interaction brings with it a need to look at elasticities for insight, not just parameters.

There are three vehicles for conveying to brand managers the implications of changes in elasticities. First, competitive maps (Cooper (1987)) are diagnostic tools to find out what events signal change in the competitive structure, and to visualize the patterns of competitive pressures corresponding to any set of conditions. Second, the logit ideal-point model (Cooper and Nakanishi (1983b)) provide diagnostic tools to help visualize how patterns of competitive pressures translate into sales. And third, the elasticities also provide the needed ingredients to perform equilibrium analyses (Carpenter, Cooper, Hanssens and Midgley (1987)), assessing optimal marketing-mix levels based on various assumptions about competitive reactions. The system of models is depicted in Figure 1.

While calibration of market-share models, category-volume models, the asymmetric three-mode factor analysis involved in developing competitive maps, and the equilibrium analyses are still main-frame based analyses, the use of market simulators brings us squarely into a micro-computing environment.

Simulators have two main uses in summarizing market response. The first could be called *static* simulations which report how a particular set of market conditions on a

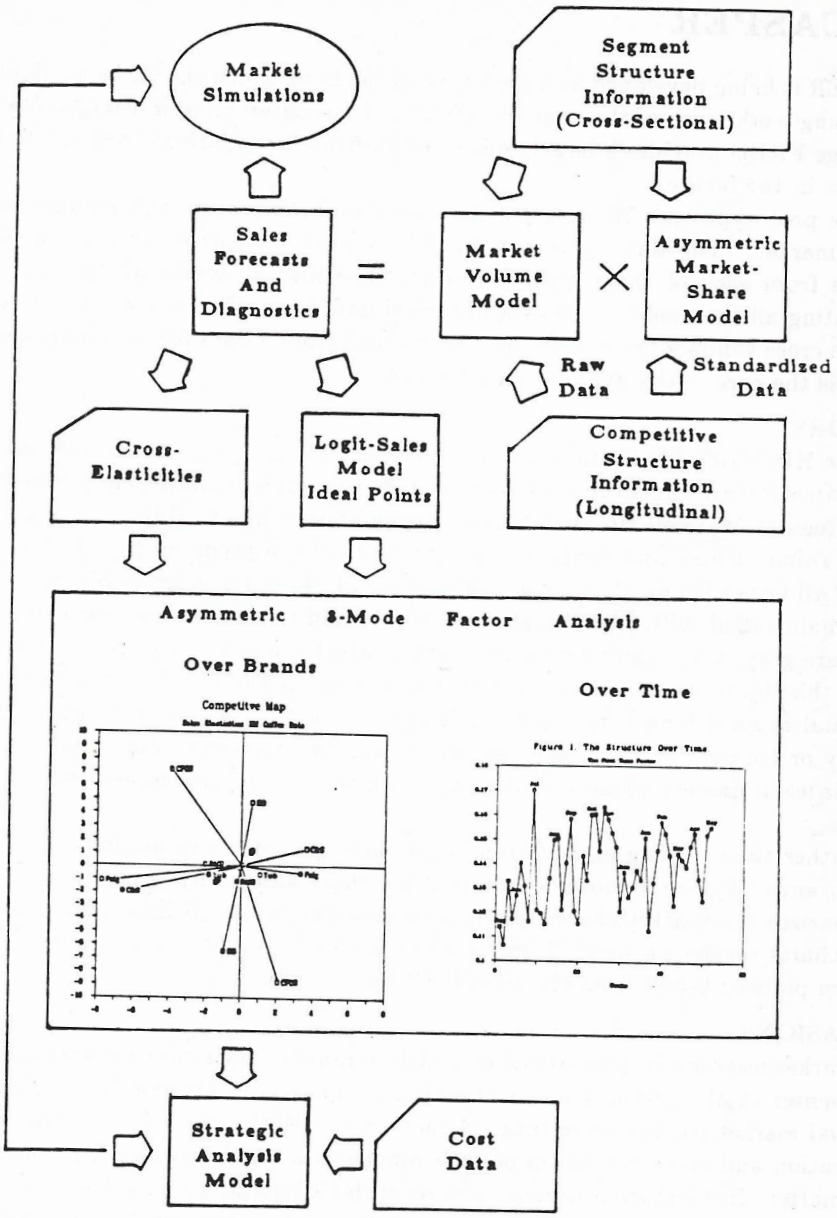

Figure 1: A System of Models for Competitive Analysis

particular occasion translates into sales (and possibly into profits). The second could be called *dynamic* simulations which show how a stream of actions over a set of time periods translates into sales (and possibly into profits). In the dynamic component the effects of advertising pulsing or wearout can be specifically modeled.

The next section reports how these ingredients are combined into software called CASPER (Competitive Analysis System for Product Performance and Promotional Effectiveness Research).

2 CASPER

CASPER is being developed as a prototype of the tools which should be available on the marketing workbench of the near-term future. Its programming in FRAMEWORK II's language FRED provides a largely open architecture for tailoring CASPER to different markets in the future.

The prototype uses 78 weeks of data on nine brands from the ground-caffeinated coffee market. The data, provided by Information Resources Inc., are weekly sales records from each of three grocery chains. The first 52 weeks of data are used for calibrating all the models, and as a historical data base. The subsequent 26 weeks are used to cross validate the models, and as the background data for the competitive game which is the core of the dynamic simulations.

HISTORY

The HISTORY file contains 52 weeks of data for each brand. Pounds sold, prices, newspaper features, in-store displays and store-coupon redemptions are tracked for Folgers, Regular Maxwell House, Maxwell House Master Blend, Hills Brs., Chock Full O Nuts, Yuban, Chase and Sanborne, an aggregate of the premium private brands called AOB (All Other Branded), and an aggregate of all the private-label economy brands for each chain called APL (All Private Labels). In addition to the raw data in HISTORY there are graphic file cabinets for each brand which contain plots such as Figure 2.

In this figure we can track market share versus price over 52 weeks with the promotional support for a brand being indicated by an "F" "D" or "C" signalling feature, display or coupon for that brand in that week. We currently track market share and sales in each grocery chain and the average over grocery chains, for each of the nine brands.

Rather than looking at one brand over time, we could summarize one time period over brands. Figure 3 shows a standard pie chart along with a digital display which summarizes the market shares, prices and promotional conditions. A complete set of such charts resides on disk. There are also menu-driven utility programs for forming custom plots or tables from the HISTORY file.

OCCASIONS

Market response is summarized by a high-parameter asymmetric market-share model (Carpenter et al. (1987), Cooper (1987)) and a category-volume model which relates internal market conditions to total category sales. With over 2000 degrees of freedom, calibration and cross validation of such models is a highly automated, relatively routine matter. But lecturing to managers on such high-parameter models is anything but routine. Simulators allow managers to experience how the market responds without dealing extensively with the methodological details of complex models. CASPER contains a menu-driven market simulator which allows the user to specify a background set of market assumptions (on prices, promotions and profits for the firms and the retailers) or accept a default set. Users can simulate market response to very flexibly specified ranges of market conditions. As a result users can assess if a promotional plan will pay out for the firm as well as for the retailers.

The results of simulations are accumulated in OCCASION files. Menu-driven utilities exist for forming plots or tables for these simulation results.

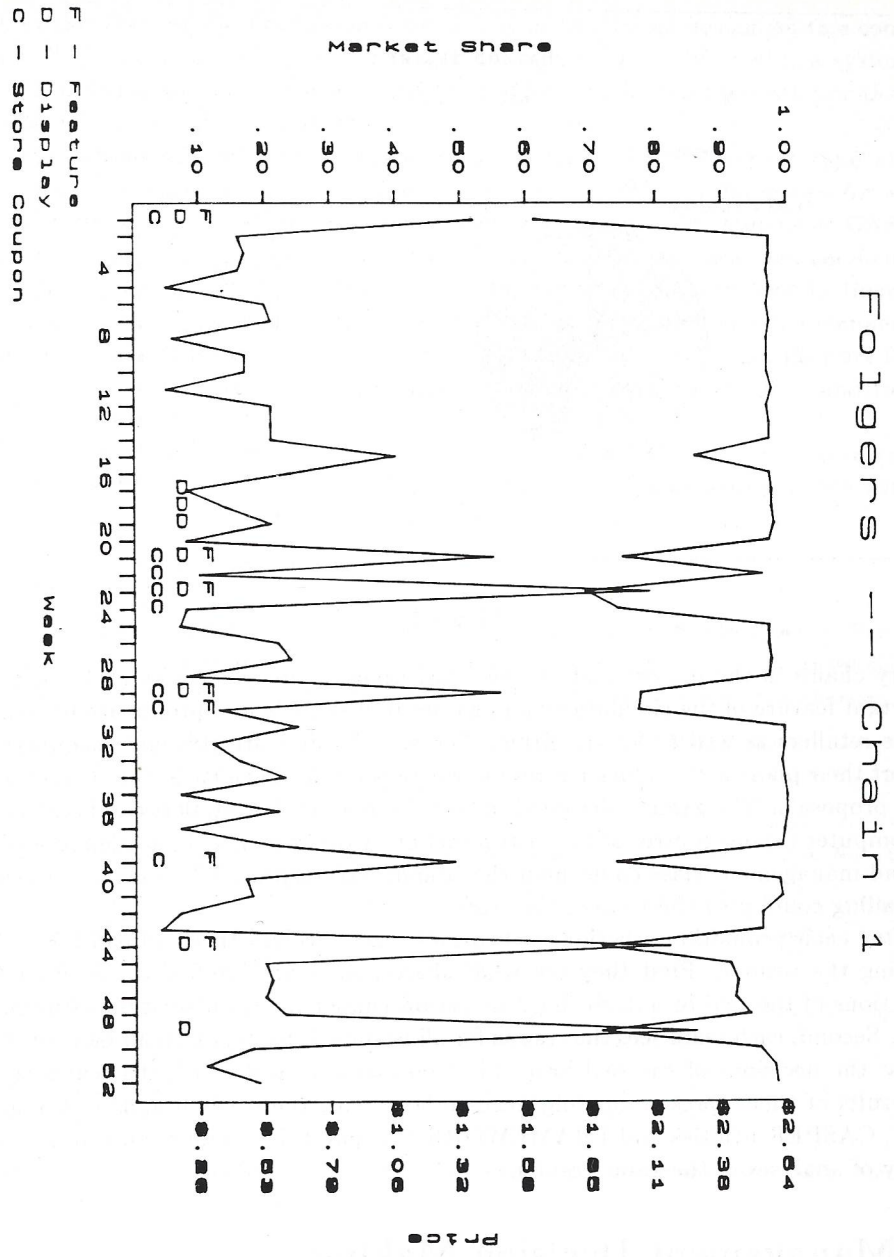

Figure 2: Market Share versus Price

COMPETITIVE GAMES

The dynamic effects of marketing plans are conveyed through competitive games. The 26 weeks of data not summarized in the HISTORY file are used as the background data. There are three promotional periods of 8 or 9 weeks each. The teams representing each brand submit a promotional plan which specifies the price to the retailer without support and the per-unit incentives for the retailer to support newspaper features, in-store displays and/or store coupons. These plans are offered to each of the three retail

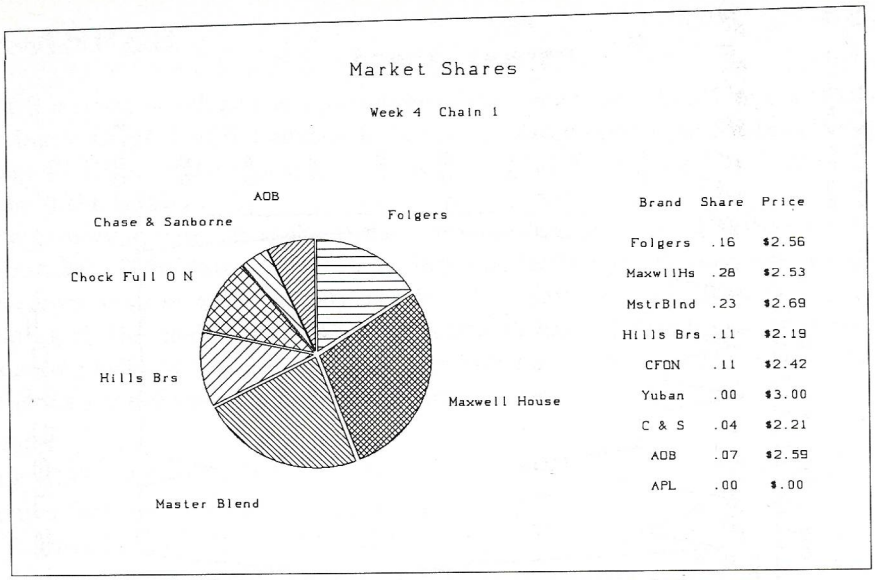

Figure 3

grocery chains in the market and can be acted upon independently by each chain. An important feature of the simulations and games is that costs and profits are broken out for the retailers as well as for the firms. The brand teams are strongly encouraged to support their plans with simulation results which show the benefits to the retailer of the firm's proposals. The game is designed so that the roles of the retailers can be played by the computer (under control of the instructor) or by other teams. In academic settings, a brand-management class could plan the brands' strategies, while a class in channels or retailing could play the roles of the stores.

After each promotional period each brand team receives three spreadsheets summarizing the results. First they see what shares, sales and profits are estimated for the actions of the real brands during this period (under the profit-margin assumptions used). Second, each team sees the results for all brands if this team's plan had competed against the decisions of the real brands in this market. And third, the teams receive the results of their plans competing head-to-head with the other brands in the game. Again, CASPER utilities and FRAMEWORK II capabilities combine to enable a wide variety of analyses of the game results.

3 Management Decision Making

Those of us involved with management research and education face the dual problems of developing relevant management tools and preparing current and future managers to use them. There are obvious tensions involved. If brand managers were captivated by the complexities of choice models or market-share models, they might well have chosen to pursue academic careers. Those of us involved in model development are rarely intrigued by the pragmatics of brand management. So where do we meet?

The design of market information systems may be as close as we can get to a common ground. This is the arena in which management science can help provide a systematic basis for utilizing data and market-response models, while management practice can use these efforts in decision making.

The emphasis on real data and real brands makes CASPER a prototype market information system which is portable to any of the hundreds of categories for which such data are available. While the development effort needed to implement CASPER in another product area is far from minor, the end result has some obvious benefits. First, brand managers spend their time learning about market response in their own product area. Second, they must make explicit the assumptions about the competition which are too often hidden or implicit in forecasts or simulations. Third, they are forced to consider the revenue and cost implications of their plans, for the firm and for the channels of distribution.

The most obvious benefit for the academicians is that their talents at research and model development can be used to advance management theory and practice without being judged for how much they know (or don't know) about selling coffee.

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